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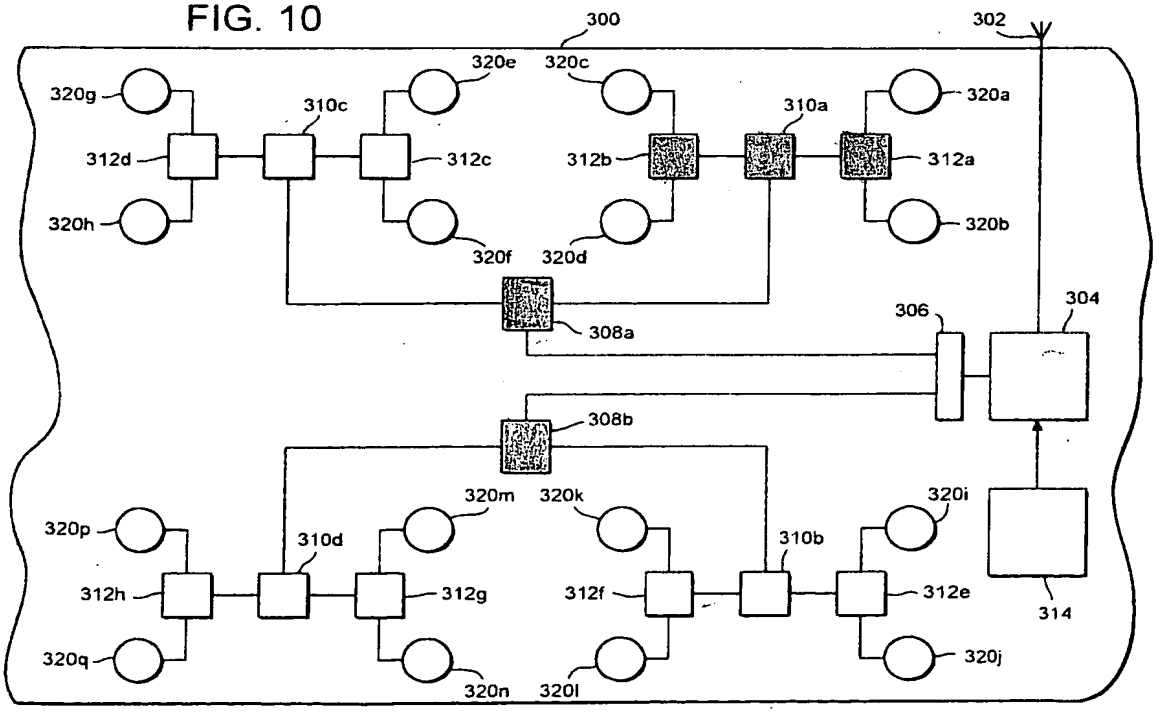
(54) Localisation registration method in mobile communication system

(57) A multi user communications terminal apparatus providing simultaneous access for a plurality of users to a communications network in which the geographical locations of each user are registered and periodically updated,

the terminal apparatus comprising a plurality of user terminals (320) each including electroacoustic transducers (34,36); and a common RF unit (304) comprising a shared RF amplifier (342) for coupling to a shared antenna system (302),

in which the terminal apparatus comprises means (348) for transmitting common location updating signals, and is arranged not to transmit separate location update signals for every one of said users.

FIG. 10



EP 0 828 354 A2

A mobile terminal may also move between the areas of two different VLRs.

In the GSM system, there is also a signalling procedure to secure periodic registration from mobile stations, to maintain information on the status of mobile stations.

Similar issues will arise in relation to satellite communications systems; see, for example, the paper "Study on network issues of medium earth orbit satellite communications systems"; Araki et al, Proceedings of the Third International Mobile Satellite Conference IMSC 1993 (JPL publication 93-009), pages 529-534, published by Jet Propulsion Laboratories (1993). In that paper it is described how either each land earth station may issue a location area identifier signal which is carried by spot beams of satellites within the area, or each spot beam of each satellite may carry a location area identifier.

Various attempts have previously been made to integrate cellular telephony and calls to aircraft. Naturally, mobile telephone users wish to use their telephones on board moving platforms such as a aircraft, but this leads to a number of problems.

Firstly, there may be interference with on board navigation systems or other equipment.

Secondly, there may be interference between aircraft systems and other systems through the coverage regions of which the aircraft is flying.

Thirdly, due to the relatively high speed with which the customer may be moving, terrestrial systems may be insufficient to cope with the number of handovers and the sudden transient loads as the moving platform passes through their coverage region.

US 5444762 discloses a system in which an aircraft monitors terrestrial channels and makes use of unused channels.

One approach is to provide a local cellular base station and switching centre on board the vehicle, to treat the vehicle as a microcell. Thus, the aircraft itself can deal with all signalling to and from the cellular telephones to handle location updating.

For example, "The provision of GSM cellular radio environments within passenger aircraft operating over Europe", I. Casewell, Fifth International Conference on Mobile, Radio and Personal Communications (11-14 December 1989) pages 57-67 published by IEE, discloses a system in which an aircraft has a transponder which includes a first air interface for communicating with mobile telephones on board, and a second air interface for communicating with terrestrial base stations.

WO 94/28684 suggests providing an aircraft with a GSM station including both a base station and a mobile switching centre, linked to terrestrial networks by a dedicated HF network. The user terminals in this case are conventional cellular handsets coupled via their external antenna sockets to connecting wires.

AU 9477530 suggests a dual mode handset which can either operate as a traditional RF handset, or through an infrared optical link when on board a vehicle such as a plane, which has a base station with an infrared interface.

Several of the above described systems are unsatisfactory in various ways. Those systems which make use of RF communications within the vehicle are not preferred because of the possibility of interference with vehicle electronic systems. On the other hand, separate systems providing non-cellular communications facilities inevitably require separate payment, and make it difficult or impossible to receive incoming calls.

Finally, the provision of base station and mobile switching centre equipment on board a vehicle for what may be a relatively small number of users is unnecessarily expensive.

The present invention, in various embodiments, is directed to alleviating one or more of the above problems.

According to one aspect, the present invention provides a multi user communications terminal apparatus providing simultaneous access for a plurality of users to a communications network in which the geographical locations of each user are registered and periodically updated, the terminal apparatus comprising a plurality of user terminals each including electroacoustic transducers; and a common RF unit comprising a shared RF amplifier for coupling to a shared antenna system, in which the terminal apparatus comprises means for transmitting common location updating signals, and is arranged not to transmit separate location update signals for every one of said users.

In another aspect, the invention provides a method of communication from a multi user terminal comprising the step of sending common location updating messages to jointly update the positions of a plurality of users of said terminal.

In another aspect, the present invention provides a method of mobility management in a mobile communications system for a plurality of mobile users, comprising updating position data for a plurality of mobile users of a multi user mobile terminal on the basis of common updating messages for said users.

In another aspect, the invention provides mobility management apparatus in a mobile communications network, for registering and periodically updating geographical locations of a plurality of users of said network, the apparatus being arranged to update the geographical locations of a plurality of users of a multi user communications terminal apparatus in dependence upon a smaller number of location updating messages received from the multi user communications terminal apparatus.

In these aspects, a considerable reduction in the volume of signalling traffic is achieved, since it is not necessary continually to update the positions of all users on board the terminal; it is preferably not even necessary to update the positions of as many users as can be allowed simultaneously to communicate via the terminal. Preferably, only a single location updating message

in response to the access request of Figure 13a;
Figure 14 is a flow diagram showing the process performed by an earth station of Figure 1 on registration of a multi user terminal in the first embodiment;
Figure 15 is a flow diagram showing the steps performed by the earth station node on location updating in the first embodiment;
Figure 16 is a block diagram showing schematically the structure of a multi user terminal according to a second embodiment;
Figure 17 is a block diagram showing schematically the structure of a user terminal of the embodiment of Figure 16;
Figure 18 is a block diagram showing schematically the structure of a baseband processing unit of the second embodiment;
Figure 19a is a flow diagram showing the process performed by a circuit switch forming part of the embodiment of Figure 16 on outgoing call access;
Figure 19b is a flow diagram showing the corresponding steps performed by a baseband processing unit of Figure 16 on outgoing call access;
Figure 20 is a flow diagram showing the steps performed by a baseband processing unit of Figure 16 on an incoming call; and
Figure 21 is a block diagram (corresponding to Figure 11) indicating the structure of a third embodiment intended to operate in conjunction with credit cards.

GENERAL ASPECTS OF EMBODIMENTS

Referring to Figure 1, a satellite communications network according to this embodiment comprises mobile user terminal equipment 2a,2b (e.g. handset 2a and vehicle platform 2b); orbiting relay satellites 4a,4b; satellite earth station nodes 6a,6b; satellite system gateway stations 8a,8b; public switched telecommunications networks 10a,10b; and fixed telecommunications terminal equipment 12a,12b.

Interconnecting the satellite system gateways 8a, 8b with the earth station nodes 6a,6b, and interconnecting the nodes 6a,6b with each other, is a dedicated ground-based network comprising channels 14a,14b, 14c. The satellites 4, earth station nodes 6 and lines 14 make up the infrastructure of the satellite communications network, for communication with the mobile terminals 2, and accessible through the gateway stations 8.

A terminal location database station 15 (equivalent to a GSM HLR) is connected, via a signalling link 60 (e.g. within the channels 14 of the dedicated network) to the gateway station and earth stations 6.

The PSTNs 10a,10b comprise, typically, local exchanges 16a,16b to which the fixed terminal equipment 12a,12b is connected via local loops 18a,18b; and international switching centres 20a,20b connectable one to another via transnational links 21 (for example, satellite links or subsea optical fibre cable links). The PSTNs 10a,10b and fixed terminal equipment 12a,12b (e.g. telephone instruments) are well known and almost universally available today.

Each mobile terminal apparatus is in communication with a satellite 4 via a full duplex channel (in this embodiment) comprising a downlink channel and an uplink channel, for example (in each case) a TDMA time slot on a particular frequency allocated on initiation of a call, as disclosed in UK patent applications GB 2288913 and GB 2293725. The satellites 4 in this embodiment are non geostationary, and thus, periodically, there is handover from one satellite 4 to another.

Mobile terminal 2

Referring to Figure 2, a mobile terminal handset equipment 2a of Figure 1 is shown.

Details of the handsets 2a,2b etc do not form part of the present invention, but they may comprise handsets similar to those presently available for use with the GSM system, comprising a digital coder/decoder 30, together with conventional microphone 36, loudspeaker 34, battery 40 and keypad components 38, and a radio frequency (RF) interface 32 and antenna 31 suitable for satellite communications. Preferably a display 39 (for example a liquid crystal display) is also provided. A 'smart card' reader 33 receiving a smart card (SIM) 35 storing user information is also provided.

The coder/decoder (codec) 30 in this embodiment comprises a low bit rate coder 30a, generating a speech bit stream at around 3.6 kilobits per second, together with a channel coder 30b applying error correcting encoding, to generate an encoded bit stream at a rate of 4.8 kilobits per second. The low bit rate coder may, for example, be a linear predictive coder such as a multipulse predictive coder (MPLPC) a code book excited linear predictive coder (CELP), a residual excited linear predictive coder (RELP) or a multiband excitation coder. Alternatively, it may employ some form of waveform coding such as subband coding.

The error protection encoding applied may employ block codes, BCH codes, Reed-Solomon codes, turbo codes or convolutional codes. The codec 30 likewise comprises a corresponding channel decoder (e.g. using Viterbi or soft decision coding) and speech decoder.

Also provided is a control circuit 37 (which may in practice be integrated with the coder 30) consisting of a suitably programmed microprocessor, microcontroller or digital signal processor (DSP) chip.

The SIM 35 preferably complies with GSM Recommendations 02.17 ("Subscriber Identity Modules"), and 11.11 and is preferably implemented as an industry standard "Smart Card". The SIM 35 and reader 33 are therefore preferably as described in International Standards ISO 7810, 7811 and 7816; these and GSM 02.17 and 11.11 are all incorporated herein by reference.

Specifically, the SIM 35 includes a processor 35a

apparatus 2, a record showing the current status of the terminal 2 (whether it is "local" or "global"; authentication data unique to each mobile terminal for validating the mobile terminal; the "home" gateway station 8 with which the apparatus is registered (to enable billing and other data to be collected at a single point) and the currently active Earth station node 6 with which the apparatus 2 is in communication via the satellite 4. The contents of the store are indicated in Figure 6a.

The signalling unit 56 and processor are arranged to receive interrogating data messages, via the signalling circuit 60 (which may be a packet switched connection), from gateways 8 or nodes 6, comprising data identifying one of the mobile terminals 2 (for example, the telephone number of the equipment 2), and the processor 58 is arranged to search the store 54 for the status and active earth station node 6 of the terminal 2 and to transmit these in a reply message via the data line 60.

Satellites 4

The satellites 4a,4b comprise generally conventional communications satellites, and may be as disclosed in GB 2288913. Each satellite 4 is arranged to generate an array of beams covering a footprint beneath the satellite, each beam including a number of different frequency channels and time slots, as described in GB 2293725 and illustrated in Figure 7a.

On each beam, the satellite therefore transmits a set of downlink frequencies. The downlink frequencies on adjacent beams are different, so as to permit frequency re-use between beams. Each beam therefore acts somewhat in the manner of a cell of a conventional terrestrial cellular system.

In this embodiment each downlink frequency carries a plurality of time division channels, so that each mobile terminal 2 communicates on a channel comprising a given time slot in a given frequency.

Within each beam there is also provided a common broadcast control channel (equivalent to the broadcast common control channel or BCCH of the GSM system) which occupies at least one of the frequencies for each beam; the frequencies used by the broadcast control channels of the beams are stored within each mobile terminal 2 which is arranged to scan these frequencies repeatedly.

Referring to Figure 8, each broadcast control channel 200 comprises interleaved synchronisation periods 202 (labelled "S") and broadcast data periods 204 (labelled "B"). Thus, mobile terminals 2 are able to acquire time and frequency synchronisation with the broadcast control channel (and hence the other communications channels) prior to reading the broadcast data 204.

The broadcast data includes, amongst other things, a field 206 containing a time value T1 specifying a re-registration interval (as in the GSM system, specified as a number of 6 minute increments) ; and a location area identifier field 208 indicating the number of the beam. For example, there may be 121 or 163 beams each carrying a respective number. The number of the satellite may also be indicated within the location area identifier 208.

The satellites 4a are arranged in a constellation in sufficient numbers and suitable orbits to cover a substantial area of the globe (preferably to give global coverage) . For example 10 (or more) satellites may be provided in two mutually orthogonal intermediate circular orbits (or more) at an altitude of, for example, 10,500 kilometres (6 hour orbits) as shown in Figure 7b. Equally, however, larger numbers of lower satellites may be used, as disclosed in EP 0365885, or other publications relating to the Iridium system, for example.

Geographical arrangement

With the number of satellites mentioned below, there may typically be 12 earth station nodes 6, two for each continent. In this manner, each earth station node 6 is connectable to gateways 8 on the continent, whilst having in view one or more satellites 4.

In this embodiment there are a significantly larger number of gateways 8 than of earth station nodes 6; on the order of one per country (i.e. over a hundred in total). For larger countries, several gateways 8 may be provided, at different geographical locations, or (where several network operators are permitted in the country) one per PSTN for different PSTNs. Smaller countries may share gateways 8. Gateways 8 may also be provided from terrestrial cellular networks.

Registration and Location

A customer mobile terminal apparatus 2 may be registered with one of two distinct statuses; "local" in which the mobile terminal apparatus is permitted only to communicate through one local area, or part of the satellite system network, and "global", which entitles the apparatus to communicate through any part of the satellite system network.

The status of each apparatus 2 (i.e. "local" or "global") is stored in the record held for the apparatus 2 concerned in the stores 54 and 48.

The operation of the above embodiment will now be described in greater detail.

The mobile terminal apparatus 2a performs an automatic registration process, of the kind well known in the art of cellular terrestrial communications, on various occasions. As is conventional, the registration process includes the broadcasting of a signal identifying the mobile terminal 2 on a common hailing or signalling frequency (such as the BCCH uplink).

The transmitted signal is picked up by one or more satellites 4. Under normal circumstances, the signal is picked up by multiple satellites 4 and forwarded to the earth station node or nodes 6 with which the satellites 4 are in communication.

the active earth station node 6 for a given destination mobile terminal, the earth station 6 examines the database 48 to determine the most recently recorded position for the mobile terminal and the most recently recorded satellite and beam.

A signal (equivalent to the paging signal of GSM) is sent on the downlink control channel (BCCH) on the identified beam of the identified satellite. If no response is received from the mobile terminal 2, the earth station node 6 examines the position stored in respect of the mobile terminal 2 within the database 48, and determines whether another beam and/or another satellite is also geometrically able to reach the user terminal 6; if so, the paging signal is repeated on the or each such beam and satellite until such contact is made.

The store 54 acts somewhat in the manner of the Home Location Register (HLR) of a GSM terrestrial cellular system, and the store 48 in the manner of the Visiting Location Register (VLR) of GSM; commercially available HLR and/or VLR equipment may therefore be employed for these components, modified as necessary.

FIRST EMBODIMENT

Referring to Figure 10 a vehicle 300 (for example an aircraft) carries an antenna system 302 coupled to a common RF stage 304. The RF stage 304 is coupled via an IF distribution system/combiner network (306-312) to a plurality of user terminal devices 320a-320q provided in arm rests or backs of seats (not shown) of the plane 300.

In this embodiment, the IF distribution system 306-312 comprises a tree structure of splitter/combiners, comprising a root unit 306 connected to two branch units 308a,308b each of which is connected to a respective pair of branch units 310a,310c; 310b,310d; each of which is in turn connected to a respective pair of branch units (312a,312b; 312c,312d; 312e,312f; 312g,312h).

Each splitter/combiner stage 306 comprises: on the uplink path from the user terminals, an amplifier and a two-to-one combiner; and, on the downlink path from the terminals, an amplifier and a one-to-two splitter.

As shown in Figure 10, the distribution of the stages 306-312 is arranged such that the runs of electrical cable connecting to the two ports of each splitter are equal; thus, the path from all user terminals to the root stage 306, and to the RF stage 304 to which it is connected, is the same.

Referring to Figure 11, each user terminal 320 in this embodiment comprises a handset similar to the mobile handset of Figure 2 and equivalent components have the same references, but lacks batteries (power being supplied from a common aircraft power source, not shown), antenna 31, and RF stage 32. The keypad 38 and display 39, both of which are coupled to the control unit 37, are omitted from Figure 11 for clarity.

Signalling (and where desired, encryption) is supplied by the control unit 37, which is coupled to an intermediate frequency modulator (IF) 41 which applies a predetermined IF offset to the baseband voice and signalling data signal, produced by the codec 30 in accordance with a selected frequency channel.

The intermediate frequency (IF) stage 41 is coupled to the nearest splitter/combiner stage 312 and thence to the common RF stage 304.

The card reader 33 is arranged to accept a subscriber information module (SIM) 35 from any customer occupying the seat.

By way of distinction from conventional user terminals, however, each of the terminal processors 37 carries the same IMEI code, which is therefore characteristic of the vehicle 300 rather than of any of the user terminals 320.

Referring now to Figure 12, the RF stage 304 comprises an RF modulator stage 340 receiving the combined IF signals from all user terminals 320 and modulating them onto a frequency determined by an RF oscillator 341, and a high power amplifier (HPA) 342 amplifying the output of the RF modulator 340a and supplying a high power signal to a port 302b of the antenna system 302.

It further comprises a low noise amplifier (LNA) 344, connected to an input port 302a of the antenna system 302 to amplify the signal received from a satellite 4, and to supply the amplified signal to an RF demodulator 340b which down converts the received signal to intermediate frequency for supply to the IF distribution network 306-321. The LNA may, in practice, be mounted adjacent the antenna system 302.

A control unit 348 (i.e. a microprocessor and/or digital signal processor chip) is arranged to receive signals from the user terminals 320 and transmit signals back thereto, and to insert signals into the IF composite signal for transmission to a satellite 4, via an IF interface 346.

The control unit 348 is also coupled to a navigation system 314 comprising, in this embodiment, a GPS satellite radio determination system, arranged to supply position co-ordinates to the control unit 314.

At any given time, not all passengers will wish, or be able, to communicate. It is therefore generally unnecessary for the high power amplifier 342 to support N simultaneous calls (where N is the total number of user terminals 320). In this embodiment, the HPA 342 is sufficiently powerful to support n+k simultaneous calls, where n is substantially smaller than N, and is the average number of likely simultaneous users, and k is a margin to allow for signalling traffic.

The power supplied by the HPA 342 is controlled by the control unit 348, in dependence upon signals received from the earth station nodes 6, to reduce the transmitted power to a minimum satisfactory level so as to reduce interference, cross talk and intermodulation distortion.

The antenna system 302 could comprise omnidirectional antennas, but in this embodiment it comprises di-

the list of subscribers sharing that IMEI code stored in the database 48 (step 3012) and accesses the records for all subscribers on the list (step 3014) to update their current satellite, beam and position data to the values received within the location updating signal.

Thus, in this embodiment, the processor 340 of the common RF stage 304 is able to supply location updating signalling data which is used to update the positions of all subscribers registered via user terminals 320 on the vehicle 300.

This achieves accurate positioning of all such subscribers, since the vehicle 300 often includes a sophisticated position determination system such as a GPS positioning system 314. Additionally, even though location updating is performed relatively frequently and accurately, the total volume of signalling traffic is relatively low, and only a single channel is required, thus reducing demands on the RF stage 304.

Further, significant hardware economies are achieved since relatively expensive RF stages are not required for each handset 320, and performance is improved since high gain and high power antennas may be employed.

SECOND EMBODIMENT

In the second embodiment, the hardware expense is further reduced by further simplifying the content of each user terminal.

Accordingly, referring to Figure 16, in this embodiment, each user terminal comprises a handset and display unit 322, providing the user interface components of the system, but lacks the signal processing of the handset 320 of the first embodiment.

Since only a limited number of handsets are able simultaneously to communicate, it is only necessary to provide a corresponding number of low bit rate coders, channel coders, signalling units and so on (collectively referred to as a baseband processing unit) to perform the processing of the baseband signal received from and supplied to each handset 322.

Accordingly, a smaller number (e.g. n, where n is the maximum number of simultaneous calls which can be supported by the high power amplifier) of baseband processing units 324a, 324b... are supplied.

The IF stages of each baseband processing unit 324 are coupled to the RF stage 304 via an IF distribution network 326.

Each baseband processing unit 324 is coupled to one of n output ports of a small telephone switch 328 (e.g. a PABX unit), to the N input ports of which the user terminals 322a ... 322q are coupled. Thus, the PABX 328 is capable of routing any user terminal 322 to any free baseband processor 324.

The PABX 328 in this embodiment is of a type which includes a call queuing process where all outgoing lines are busy.

Also provided is a store 330 commonly accessible by all the baseband processing units 324, and containing an entry for each of the user terminals 322 indicating the identity (e.g. the International Mobile Subscriber Identity or Temporary Mobile Subscriber Identity (IMSI or TMSI)) of the subscriber last registered at that user terminal.

On each occasion when an SIM 35 is inserted into the card reader 33, the identity stored thereon is transmitted to the store 330 and stored at the location for the corresponding user terminal 322; likewise when a new temporary mobile subscriber ID is received during a call by a baseband processor unit 324 it is stored in relation to the user terminal 322 via which the call is being conducted.

Referring to Figure 17, each handset 322 therefore comprises the loudspeaker 34, microphone 36, keypad 38, display 39 and card reader 33 of a cellular handset as described in relation to Figure 2, together with a terminal control device 37a (e.g. a micro processor). The control device 37a is arranged to respond to the card reader 33 or keypad 38 to supply tone or out of band signals to the baseband processing unit 324, and is arranged to receive tone or out of band signals therefrom and to control the display 39 in response thereto.

Referring to Figure 18, each baseband processing unit 324 comprises a low bit rate coder 30a and channel coder 30b, and a signalling control circuit 37b generally equivalent to the control device 37 described in the above embodiments, together with the intermediate frequency stage 41 described above. In this embodiment, the signalling control circuit 37b is arranged to communicate with the terminal control circuit 37a via tone or out of band signalling.

The operation of this embodiment will now be described in greater detail.

Outgoing call set up

On initiation of a call by an attempt to dial on the keypad 38, the PABX 328 determines (Figure 19a, step 4002) whether one of its output lines to baseband processing units 324 is not busy. When all lines are busy, the user terminal 322 is entered into the PABX queuing system (step 4404) until a line is released (step 4006).

When a free line is available, the PABX 328 connects the user terminal 322 to the free baseband processing unit 324.

On determining (step 4010) that the call is complete (e.g. on hang up of the handset 322 or loss of signal via the baseband processing unit 324) the PABX releases the line (step 4012).

Referring to Figure 19b, on connection to a baseband processing unit, the baseband processing unit 324 is supplied with the ID (e.g. the International Mobile Subscriber Identity) of the SIM 35 from the terminal control unit 37a and, in step 4022, the baseband processor 324 accesses the store 330 and updates (if necessary) the ID record stored for the user terminal 322 from which

cated are purely exemplary. Smaller numbers of geostationary satellites, or satellites in higher altitude orbits, could be used; or larger numbers of low earth orbit (LEO) satellites could be used. Equally, different numbers of satellites in intermediate orbits could be used.

Although TDMA has been mentioned as a suitable access protocol, the present invention is fully applicable to other access protocols, such as code division multiple access (CDMA) or frequency division multiple access (FDMA), or even single carrier per channel (SCPC).

Equally, whilst the principles of the present invention are envisaged above as being applied to satellite communication systems, the possibility of the extension of the invention to other communications systems (e.g. digital terrestrial cellular systems such as GSM) is not excluded.

Although, for the sake of convenience, the term "mobile" has been used in the foregoing description to denote the terminals 2, it should be understood that it is possible to practice the invention with some of the terminals 2 being completely immobile.

Instead of providing a single central database station 15 storing details of all terminal equipment 2, similar details could be stored at the home gateway 8 for all terminal equipment to register with that home gateway 8.

In the foregoing, the gateways 8 may in fact be comprised within an ISC or exchange or mobile switching centre (MSC) by providing additional operating control programmes performing the function of the gateway.

In the foregoing, dedicated ground networks lines have been described, and are preferred. However, use of PSTN or PLMN links is not excluded where, for example, leased lines are unavailable or where temporary additional capacity is required to cope with traffic conditions.

It will naturally be clear that the stores within the gateways 8 need not be physically co-located with other components thereof, provided they are connected via a signalling link.

Whilst, in the foregoing, the term "global" is used, and it is preferred that the satellite system should cover all or a substantial part of the globe, the invention extends also to similar systems with more restricted coverage (for example of one or more continents).

It will be understood that the geographical locations of the various components of the invention are not important, and that different parts of the system of the above embodiments may be provided in different national jurisdictions. For the avoidance of doubt, the present invention extends to any part or component of telecommunications apparatus or systems which contributes to the inventive concept.

The foregoing, and all other variants, embodiments, modifications or improvements to the invention are intended to be comprised within the present invention.

Claims

1. A multi user communications terminal apparatus providing simultaneous access for a plurality of users to a communications network in which the geographical locations of each user are registered and periodically updated,

   the terminal apparatus comprising a plurality of user terminals (320) each including electroacoustic transducers (34,36); and a common RF unit (304) comprising a shared RF amplifier (342) for coupling to a shared antenna system (302),
   in which the terminal apparatus comprises means (348) for transmitting common location updating signals, and is arranged not to transmit separate location update signals for every one of said users.

2. Apparatus according to claim 1, further comprising a plurality of signal processing units (324) arranged to encode and decode signals from users of said user terminals (322) prior to RF modulation thereof.

3. Apparatus according to claim 2, in which there are provided fewer said signal processing units (324) than the number of said user terminals (322), and further comprising a routing device (328) for selectively interconnecting said user terminals (322) and signal processing units (324).

4. Apparatus according to any preceding claim where each said user terminal (322) comprises an input device (33) for accepting a user identification code.

5. Apparatus according to claim 4 in which the input device comprises a reader (33) for an insertable and removable electronic device (35).

6. Apparatus according to claim 4 or claim 5, further comprising a store (330) for storing data associating said user interface terminals (322) with the identities of the users thereof.

7. Apparatus according to claim 6 appended to claim 3 in which, on receipt of an incoming call, the routing device (328) is responsive to the store (330) to selectively interconnect the one of said user terminals (322) recorded in said store (330) as corresponding with a given user to the signal processing unit (324) receiving said incoming call.

8. Apparatus according to claim 2 in which each said user terminal (320) comprises a said signal processing unit (30).

9. Apparatus according to any preceding claim, further

interconnect one or said signal processing devices (324) with the one of said user interface units (322) associated with said user.

25. Apparatus according to any preceding claim in which said communications network comprises a satellite communications network including at least one communications satellite (4) via which signal are relayed to and from said multi user communications terminal apparatus.

26. A method of mobility management in a mobile communications system for a plurality of mobile users, comprising updating position data for a plurality of mobile users of a multi user mobile terminal on the basis of common updating messages for said users.

27. A method of communication from a multi user terminal comprising the step of sending common location updating messages to jointly update the positions of a plurality of users of said terminal.

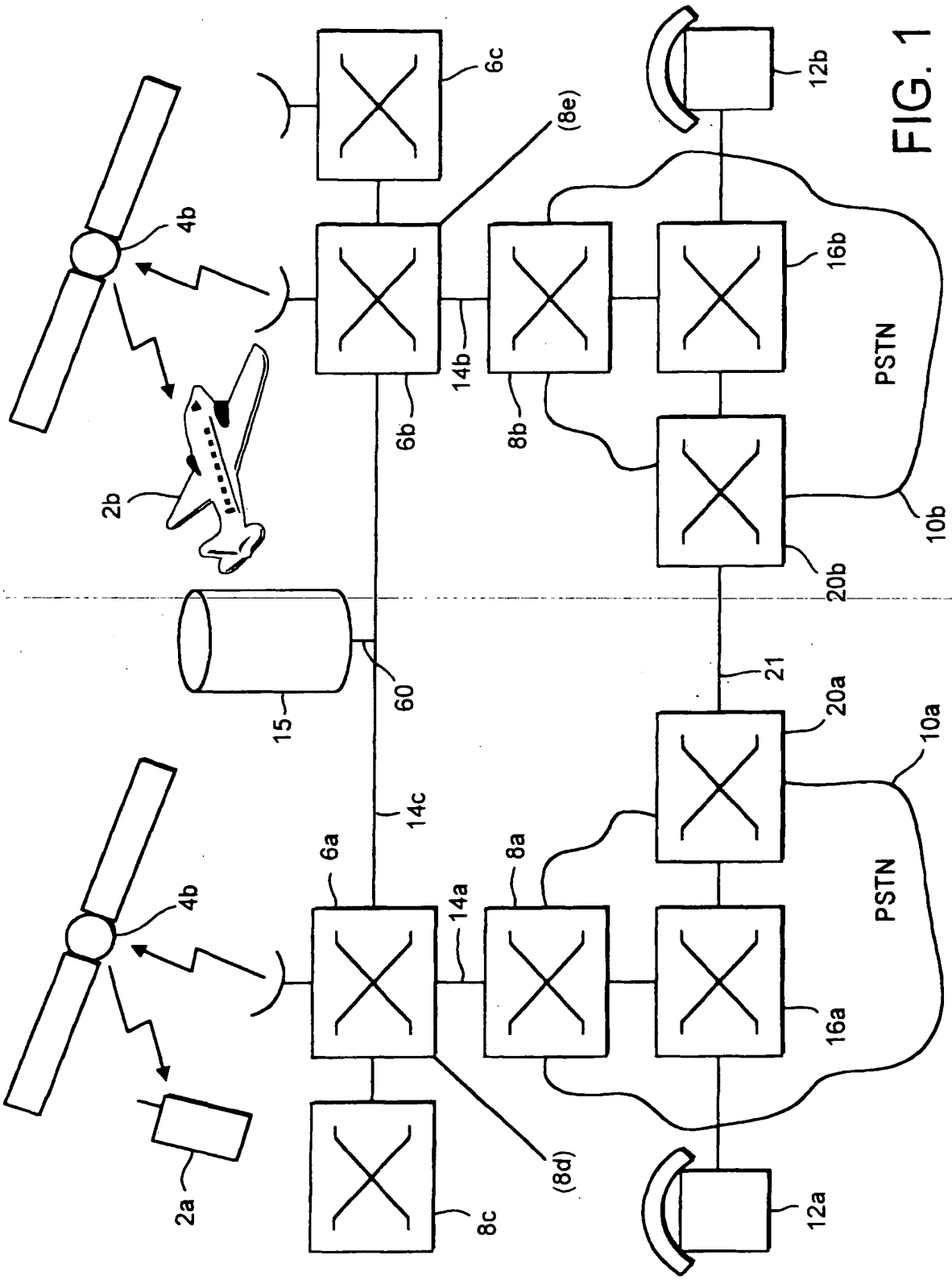
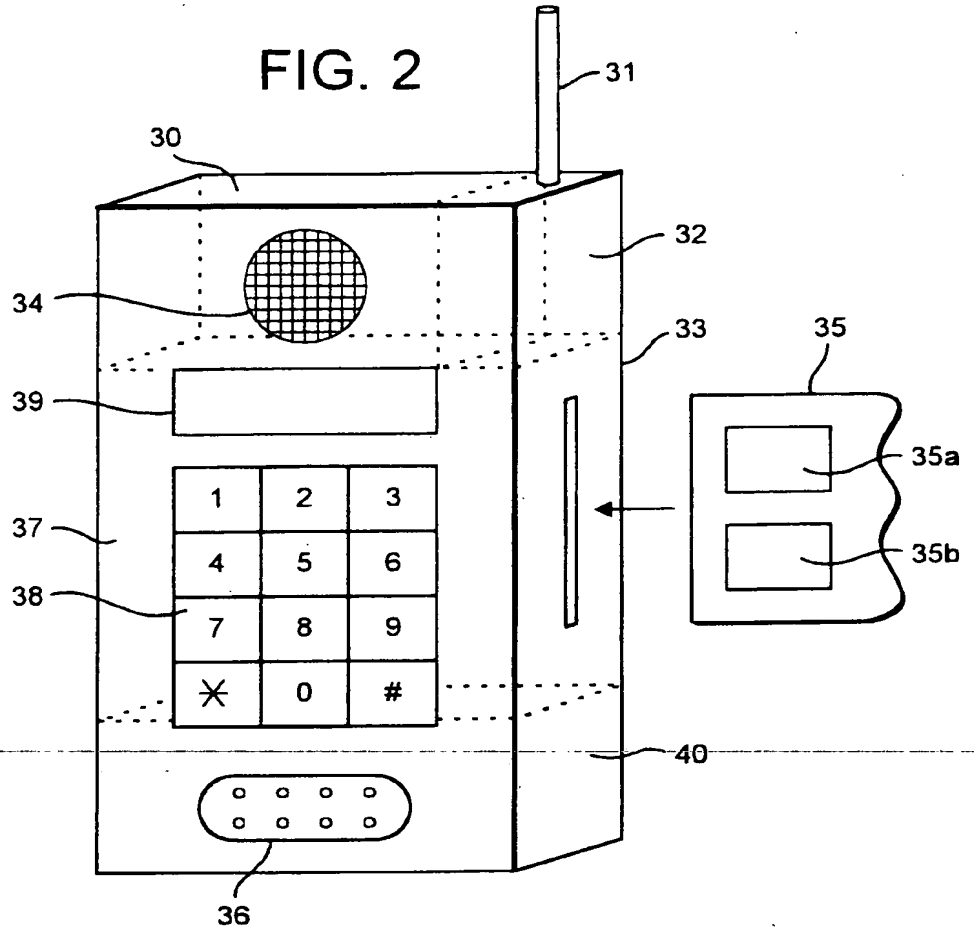

6c
12b
(8e)
4b
16b
14b
PSTN
2b
6b
8b
10b
20b
15
60
21
20a
10a
14c
6a
8a
4b
14a
PSTN
16a
(8d)
2a
8c
12a

FIG. 1

FIG. 2



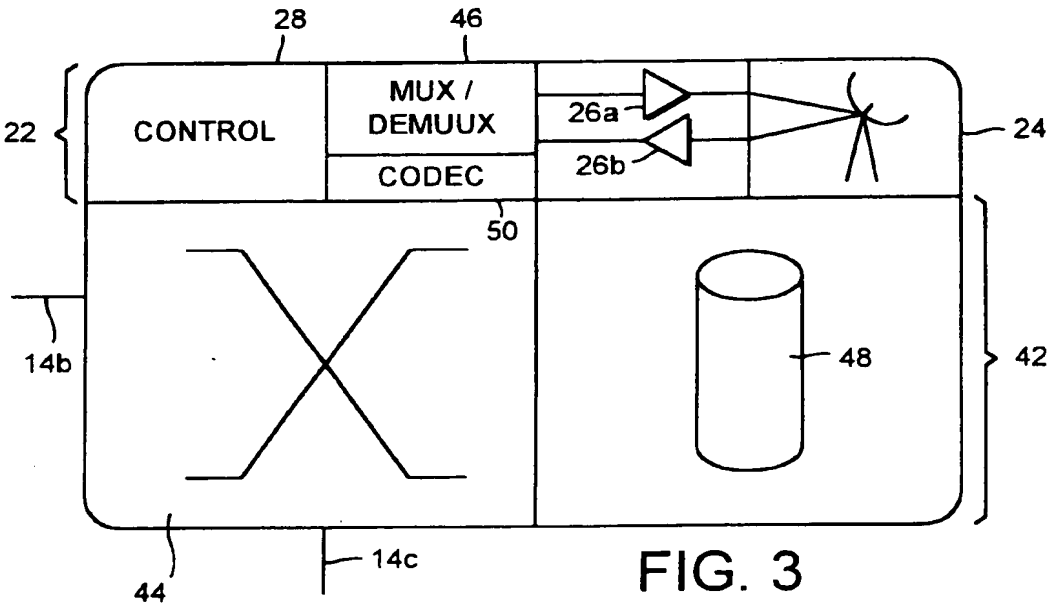


FIG. 3

earth station node 6

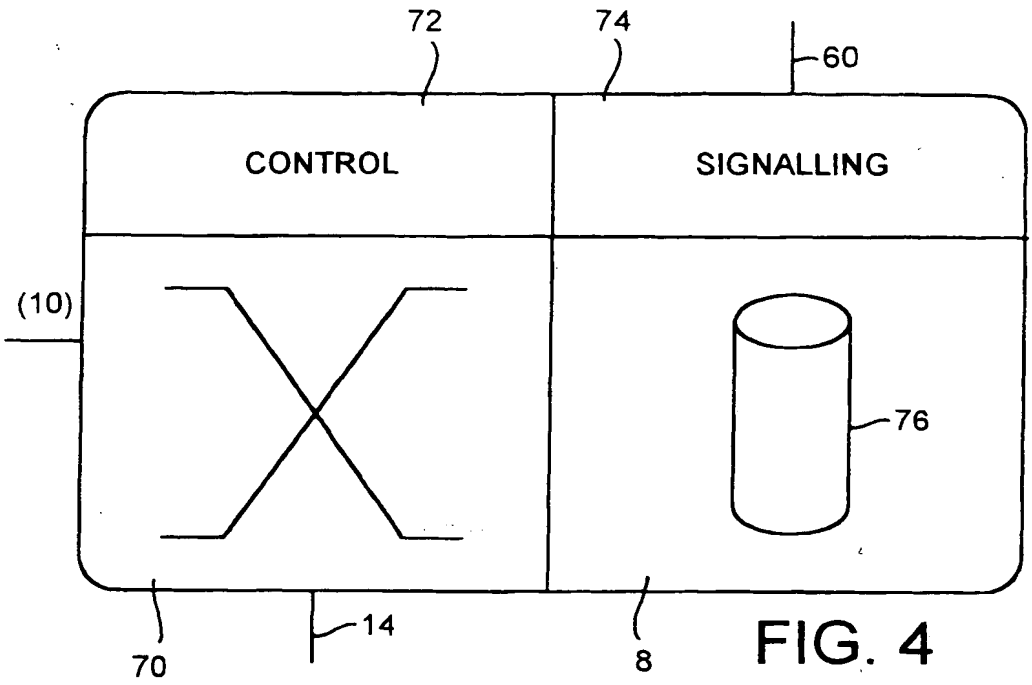


FIG. 4

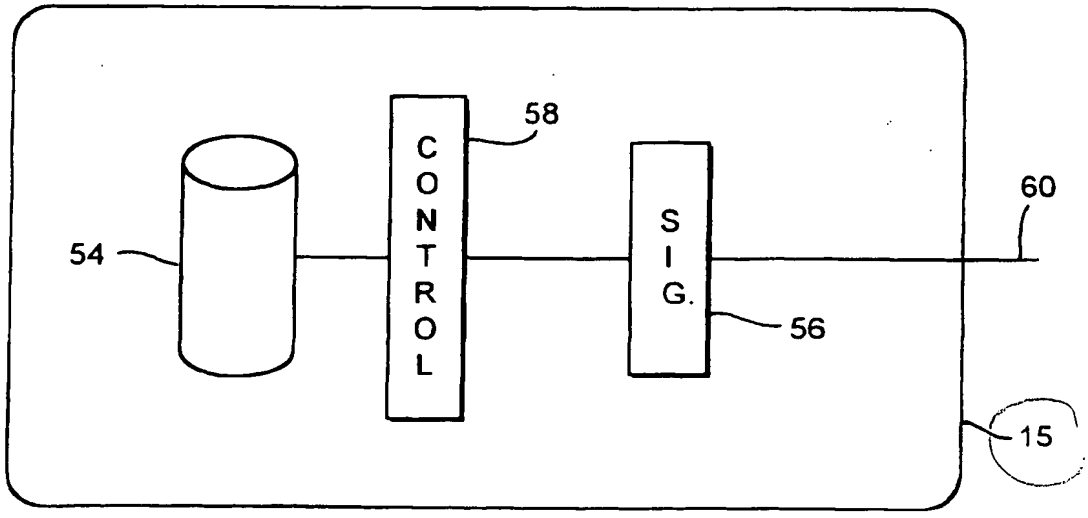


FIG. 5

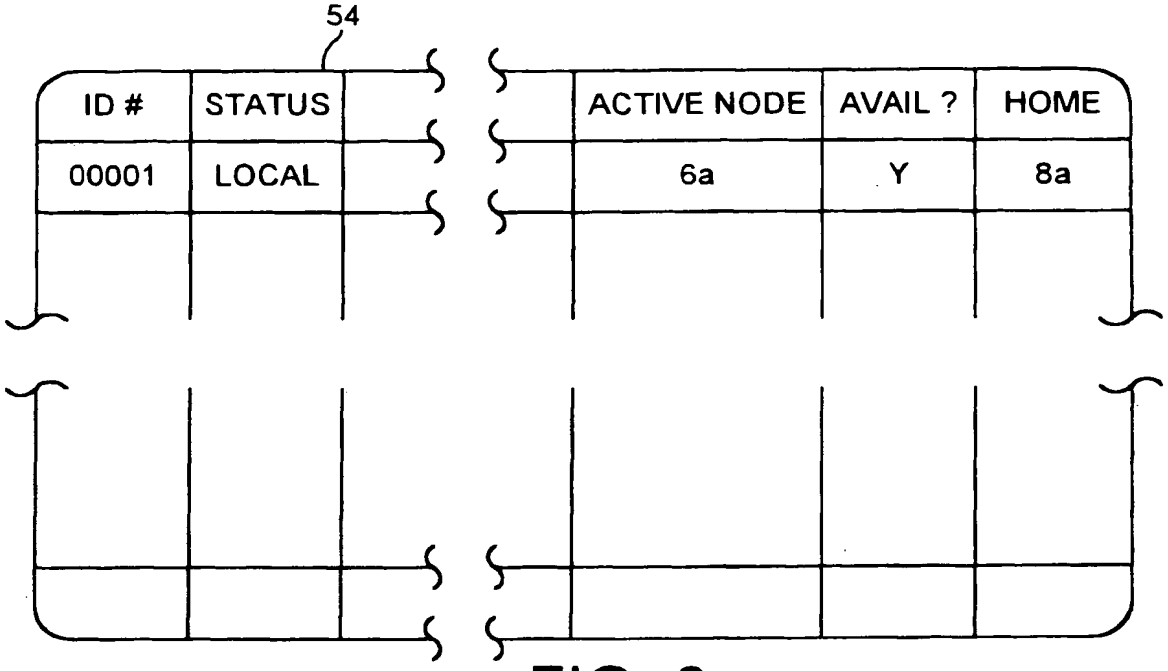

54
ID #
STATUS
ACTIVE NODE
AVAIL ?
HOME
00001
LOCAL
6a
Y
8a

FIG. 6a

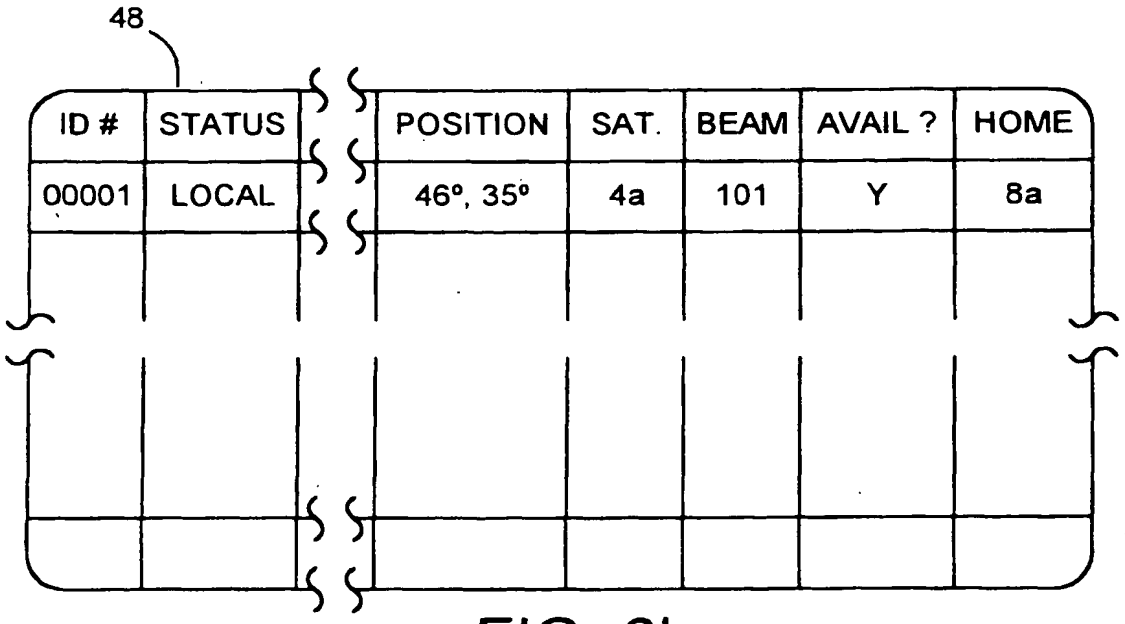
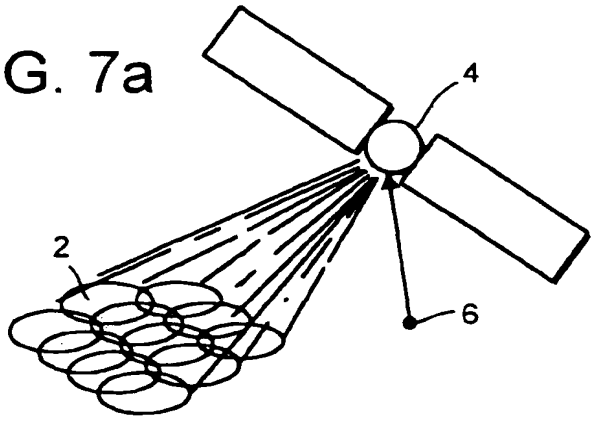

48
ID #
STATUS
POSITION
SAT.
BEAM
AVAIL ?
HOME
00001
LOCAL
46°, 35°
4a
101
Y
8a

FIG. 6b

FIG. 7a



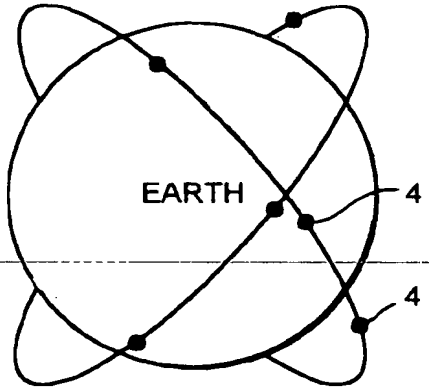


FIG. 7b

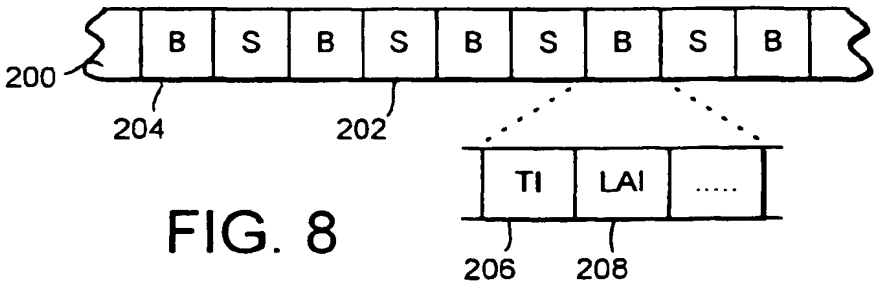


FIG. 8

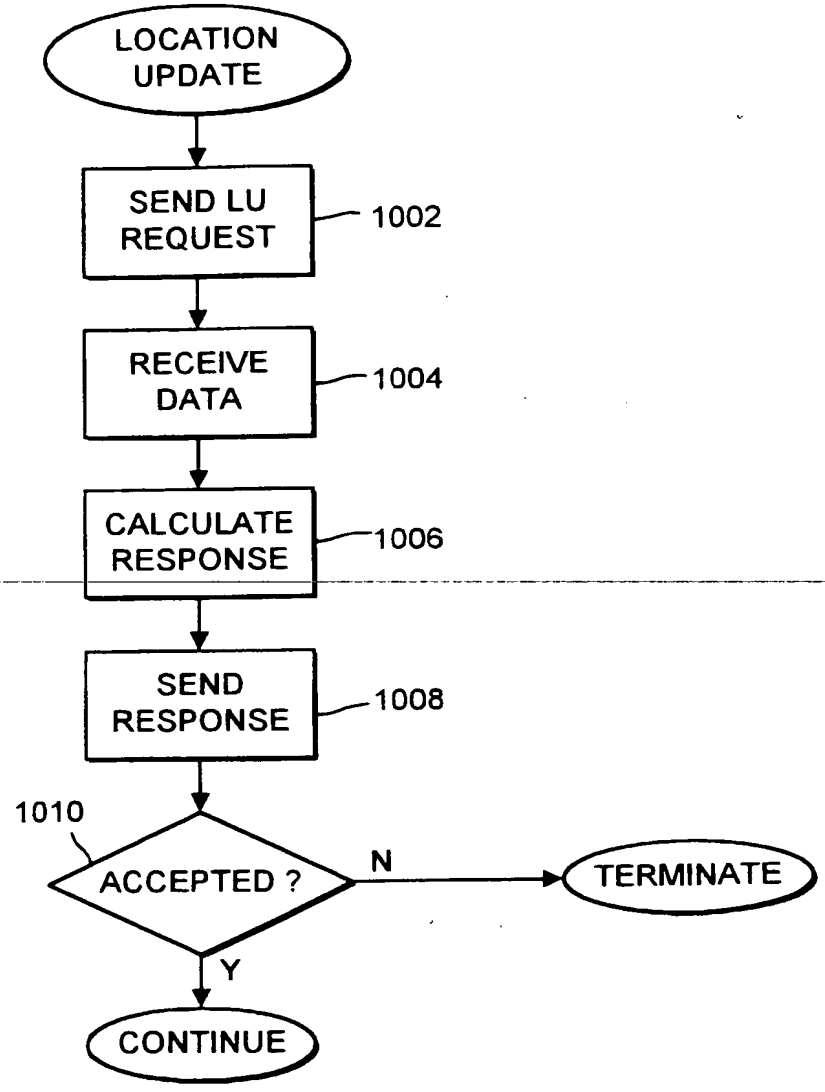

LOCATION UPDATE
SEND LU REQUEST
1002
RECEIVE DATA
1004
CALCULATE RESPONSE
1006
SEND RESPONSE
1008
1010
ACCEPTED ?
N
TERMINATE
Y
CONTINUE

FIG. 9a

FIG. 9b

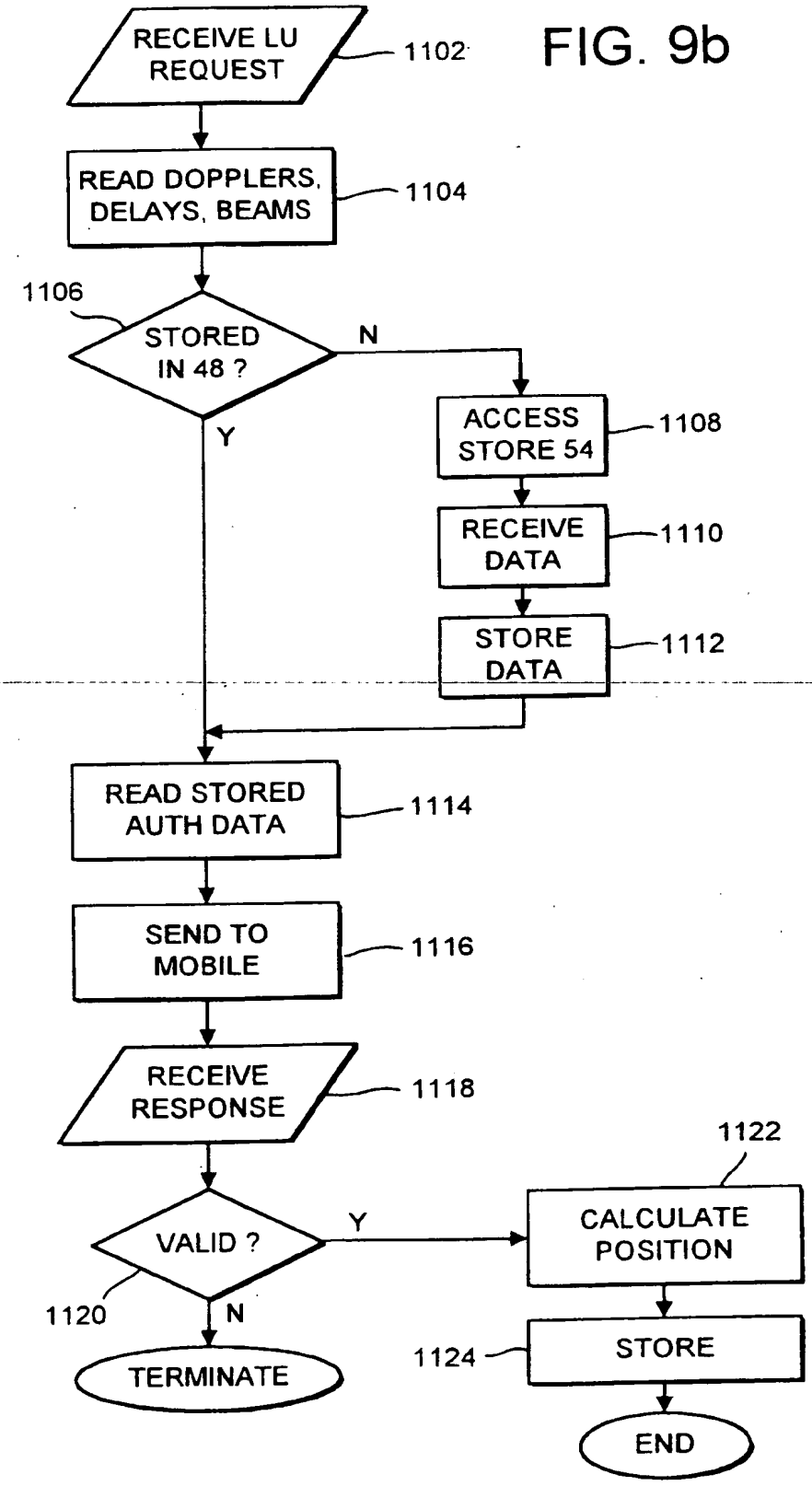
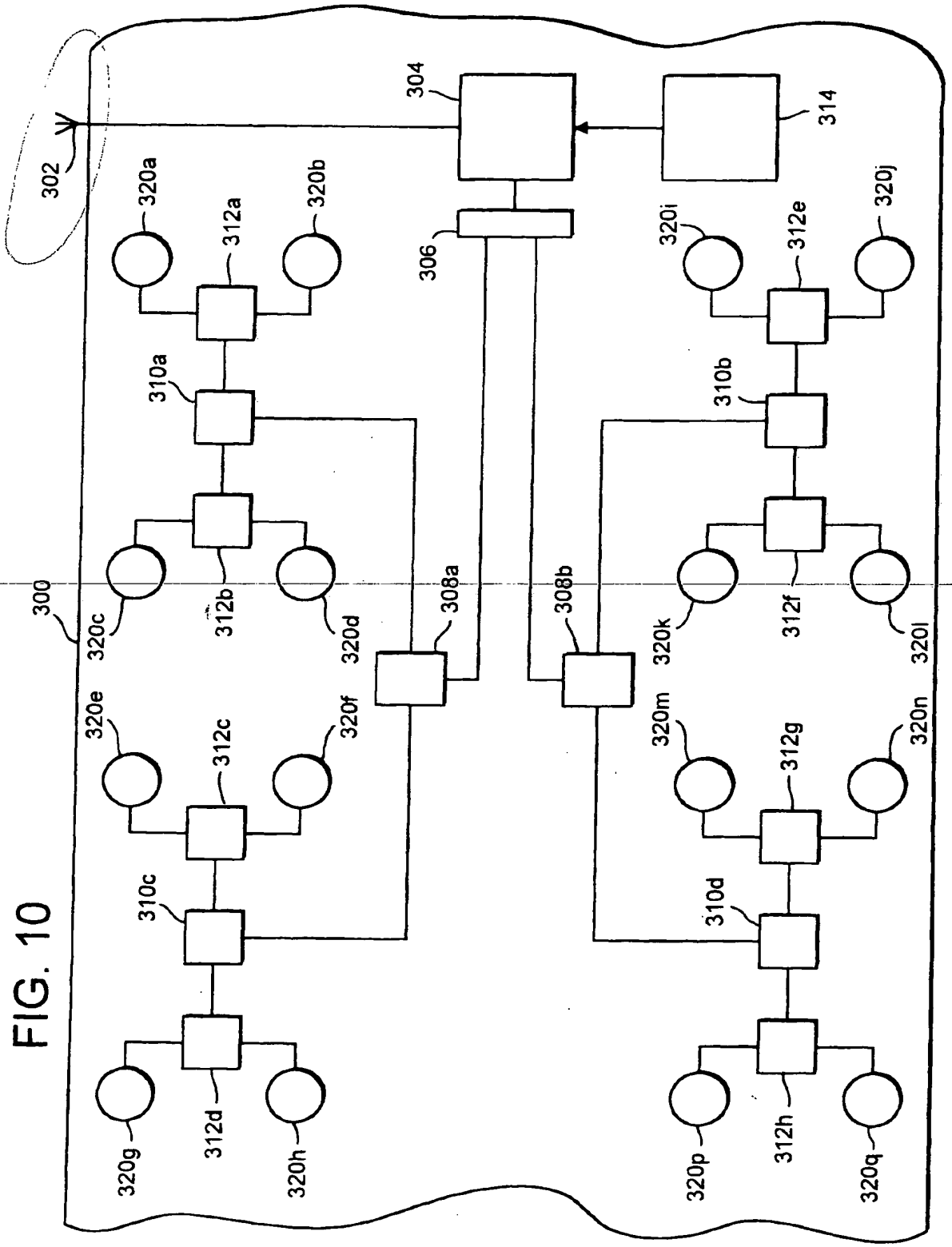

RECEIVE LU REQUEST
1102
READ DOPPLERS, DELAYS, BEAMS
1104
1106
STORED IN 48 ?
N
Y
ACCESS STORE 54
1108
RECEIVE DATA
1110
STORE DATA
1112
READ STORED AUTH DATA
1114
SEND TO MOBILE
1116
RECEIVE RESPONSE
1118
1122
VALID ?
Y
CALCULATE POSITION
1120
N
1124
STORE
TERMINATE
END

FIG. 10


300
302
304
306
308a
308b
310a
310b
310c
310d
312a
312b
312c
312d
312e
312f
312g
312h
314
320a
320b
320c
320d
320e
320f
320g
320h
320i
320j
320k
320l
320m
320n
320p
320q

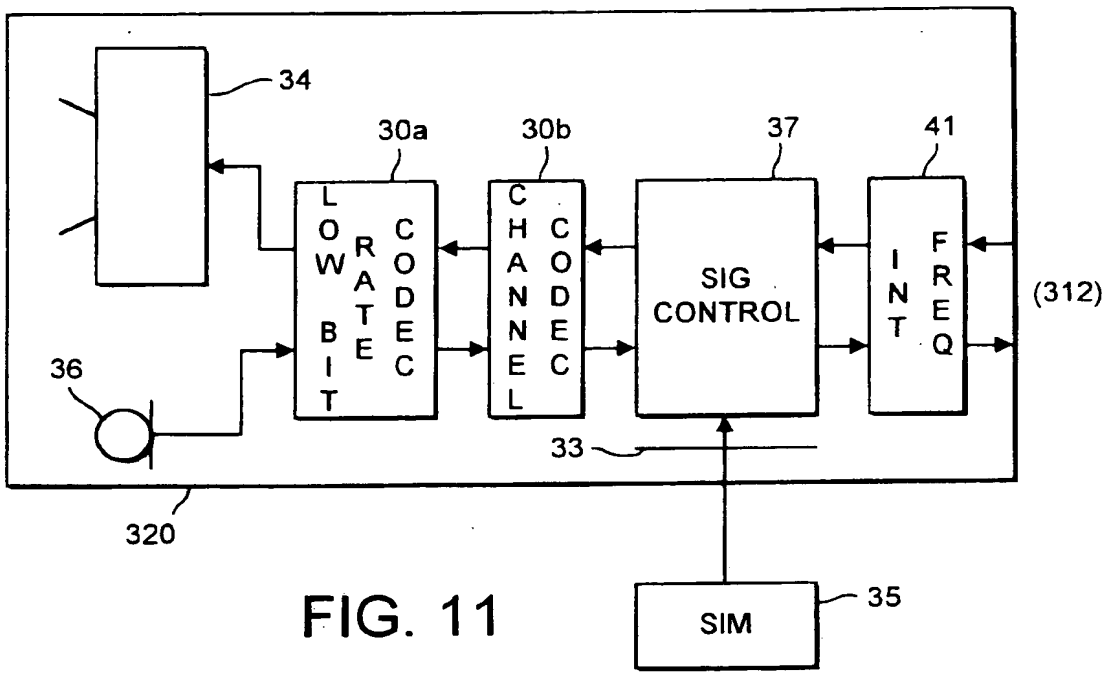
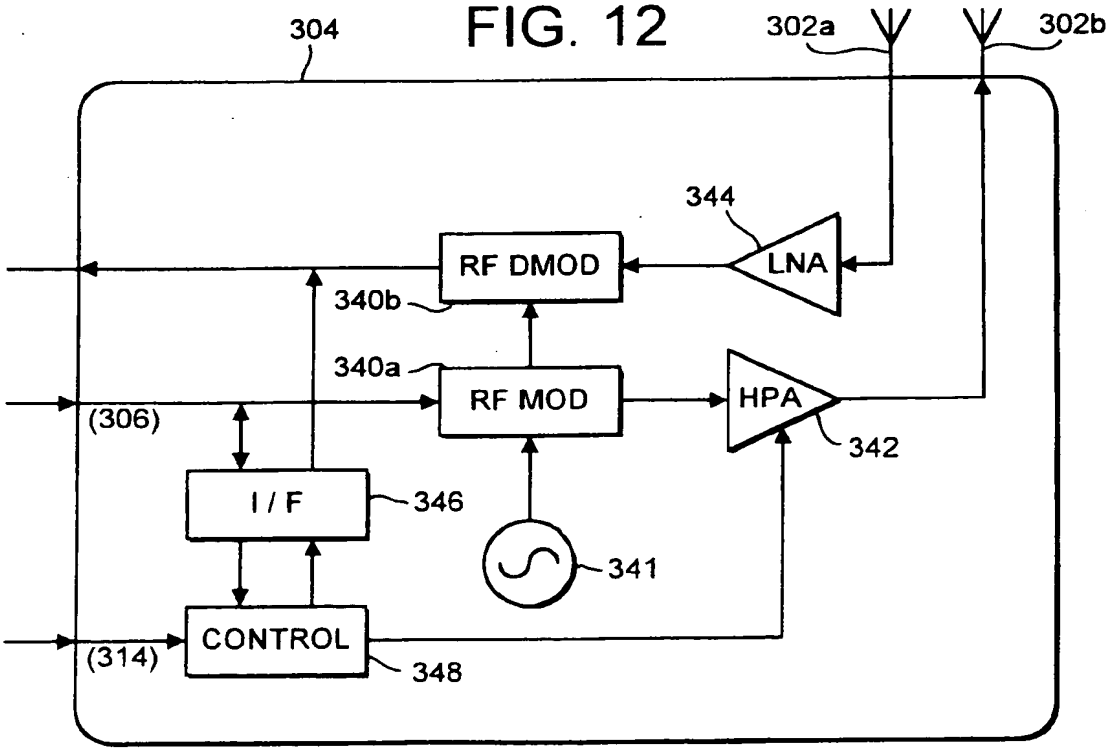


FIG. 11

FIG. 12



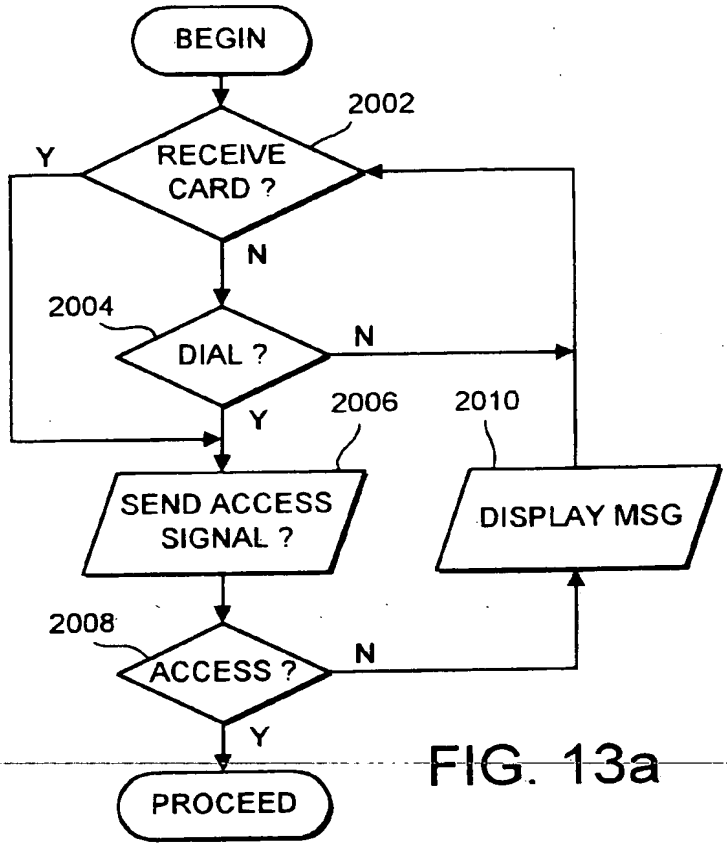


FIG. 13a

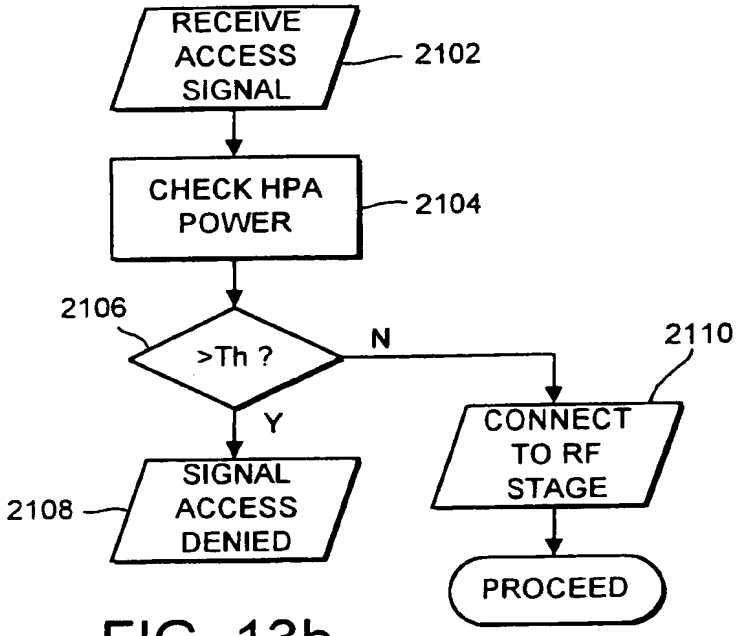


FIG. 13b

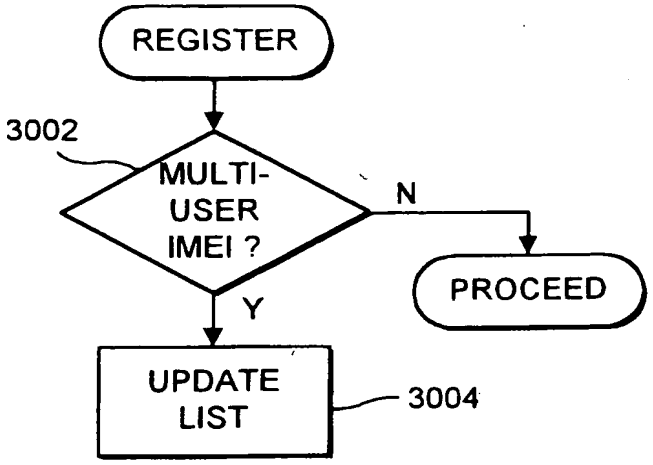

REGISTER
3002
MULTI-USER IMEI ?
N
PROCEED
Y
UPDATE LIST
3004

FIG. 14

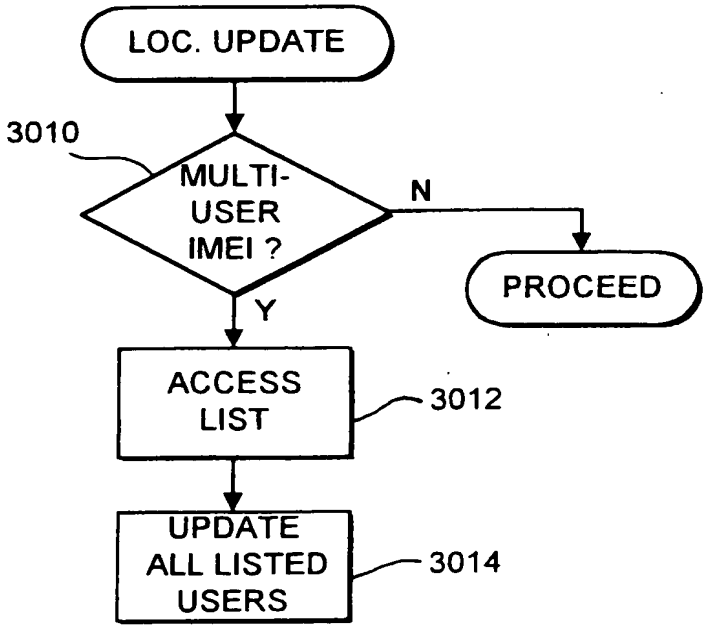

LOC. UPDATE
3010
MULTI-USER IMEI ?
N
PROCEED
Y
ACCESS LIST
3012
UPDATE ALL LISTED USERS
3014

FIG. 15

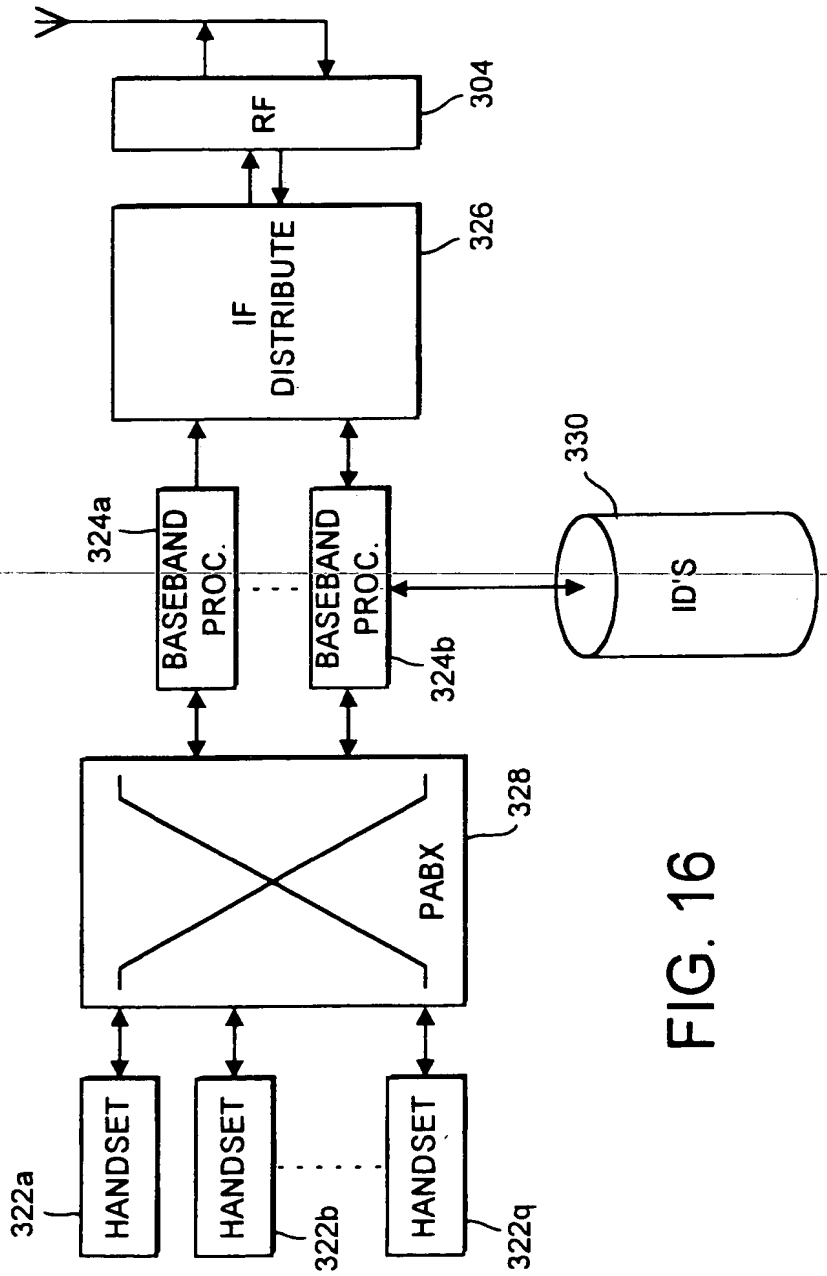


FIG. 16

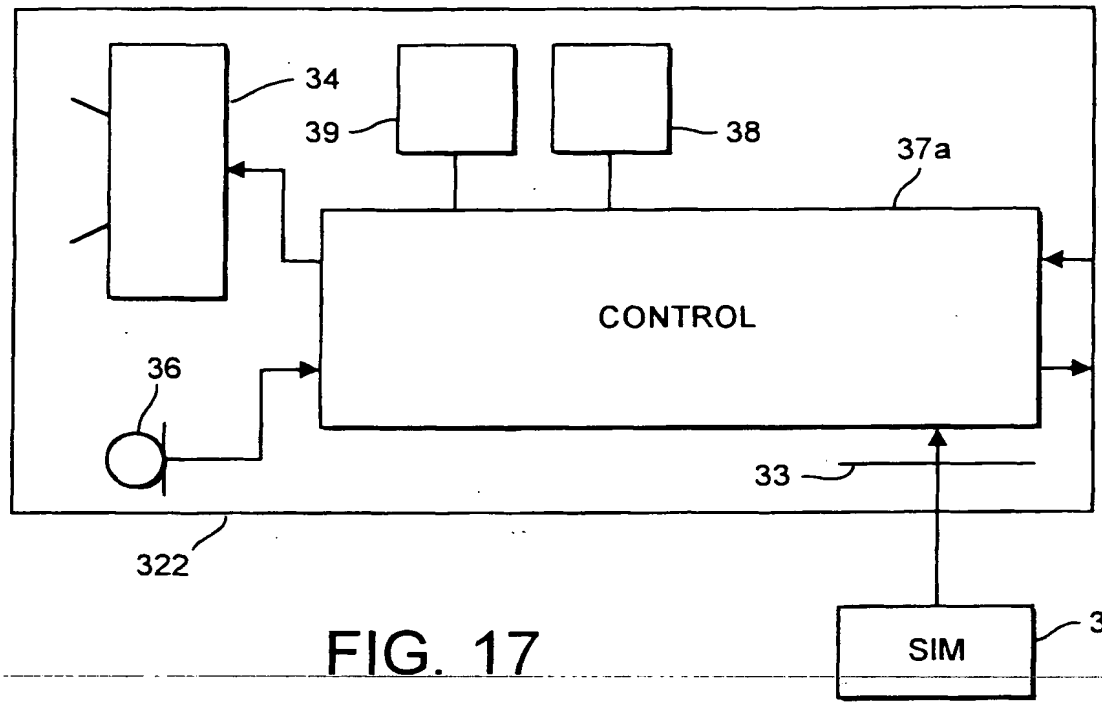

34
39
38
37a
CONTROL
36
33
322
SIM
35

FIG. 17

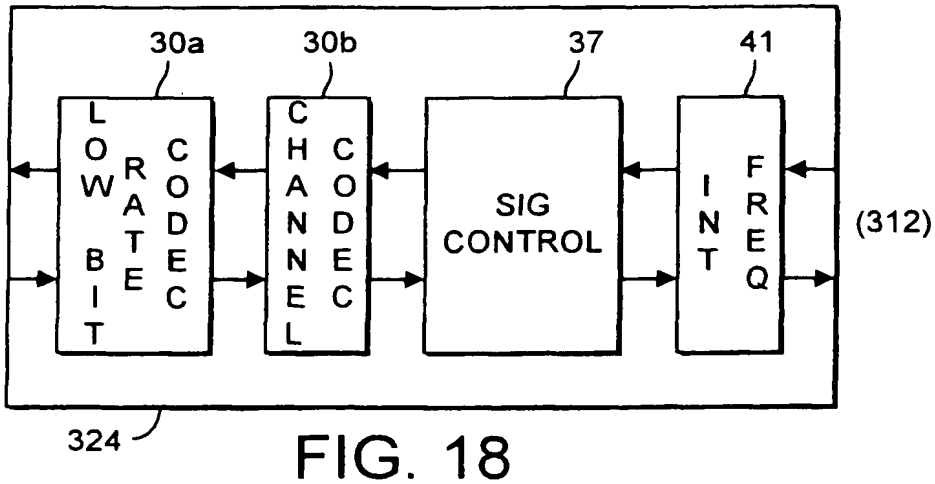

30a
30b
37
41
LOW BIT RATE CODEC
CHANNEL CODEC
SIG CONTROL
INT FREQ
(312)
324

FIG. 18

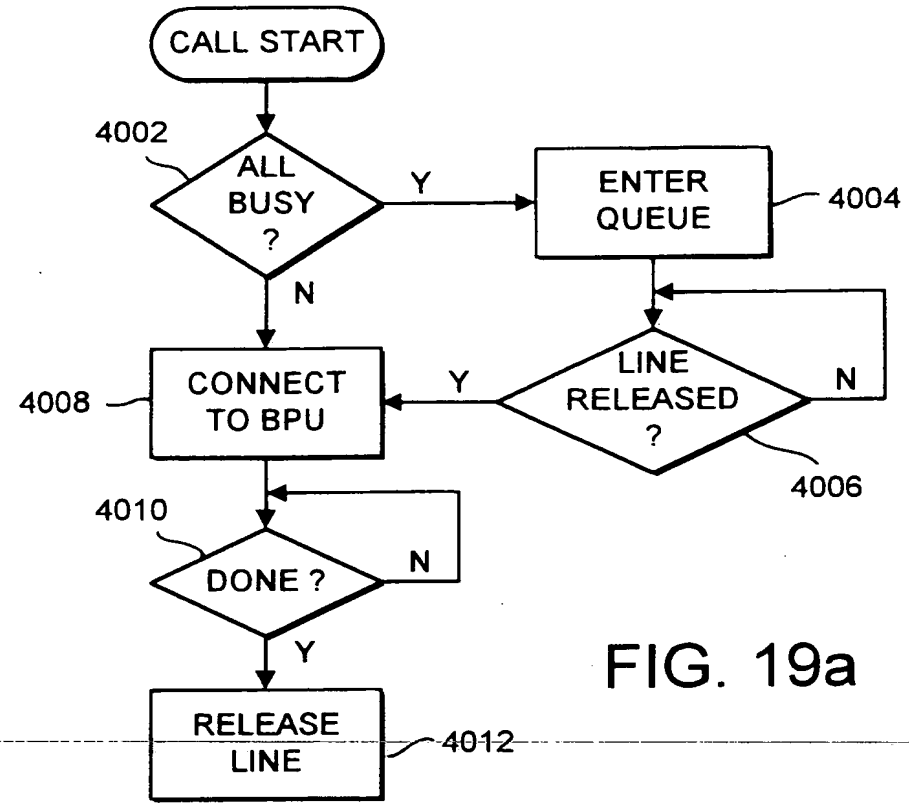


FIG. 19a

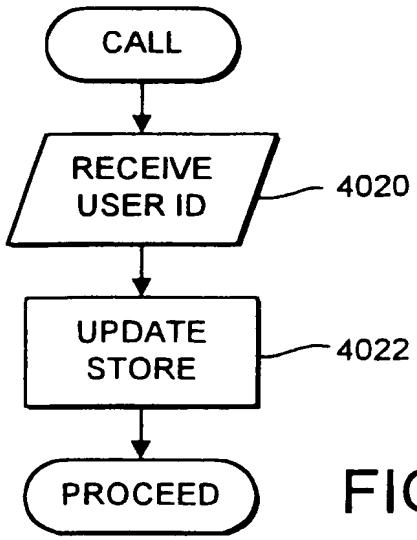


FIG. 19b

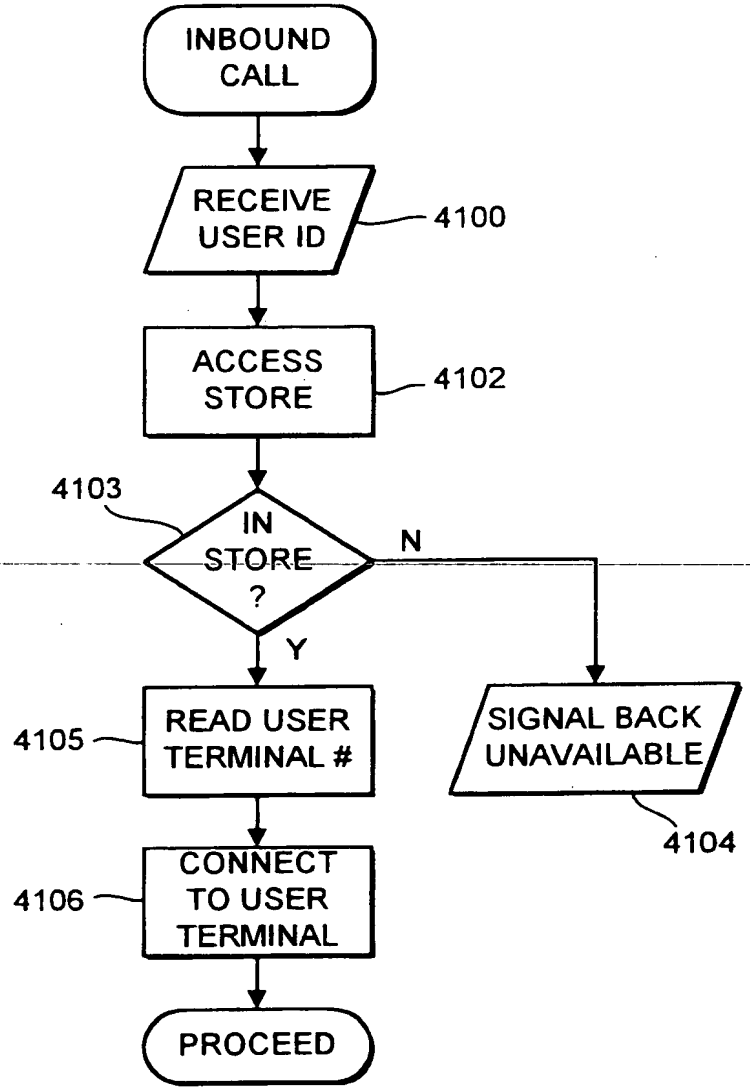
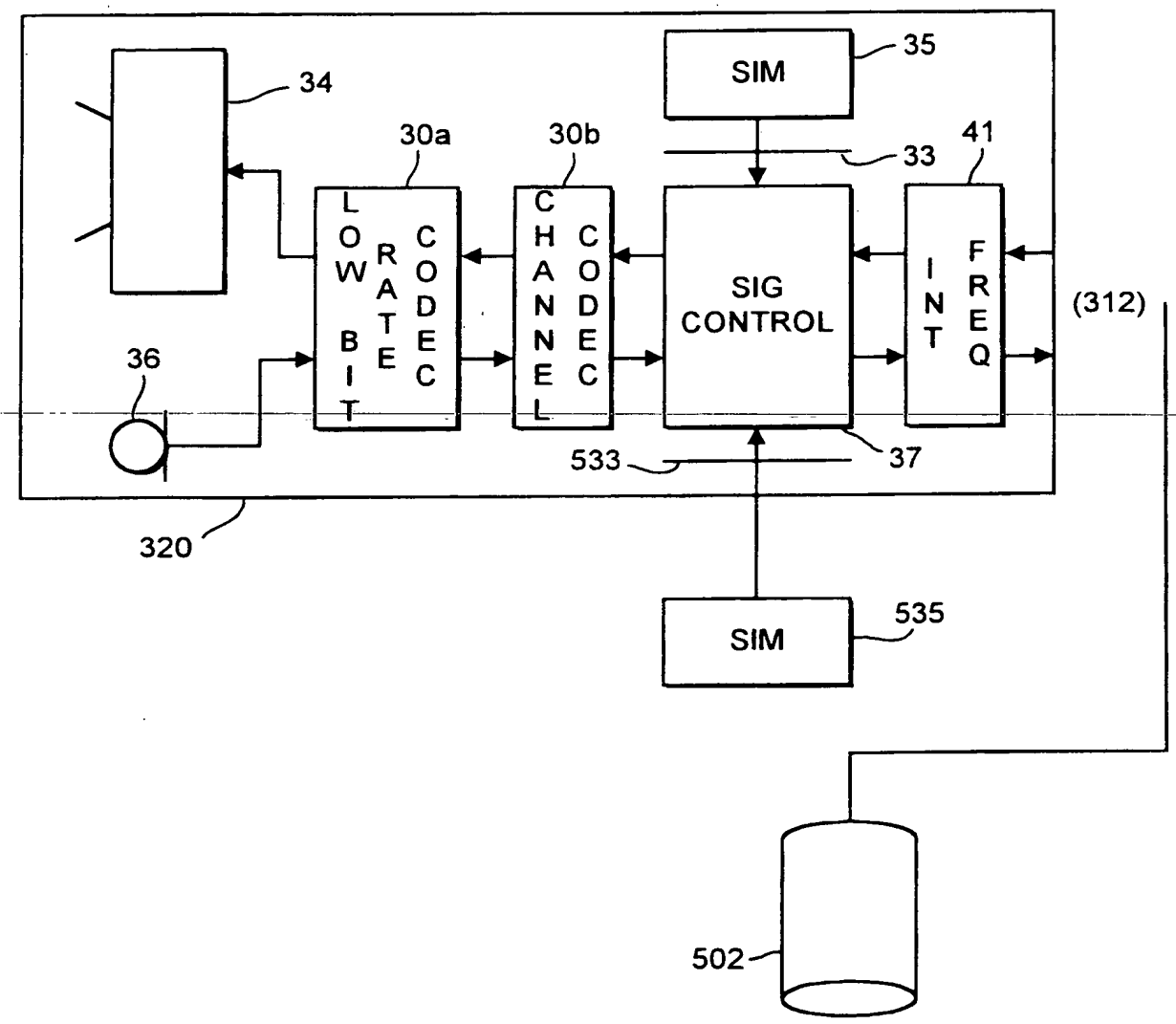


FIG. 20

FIG. 21



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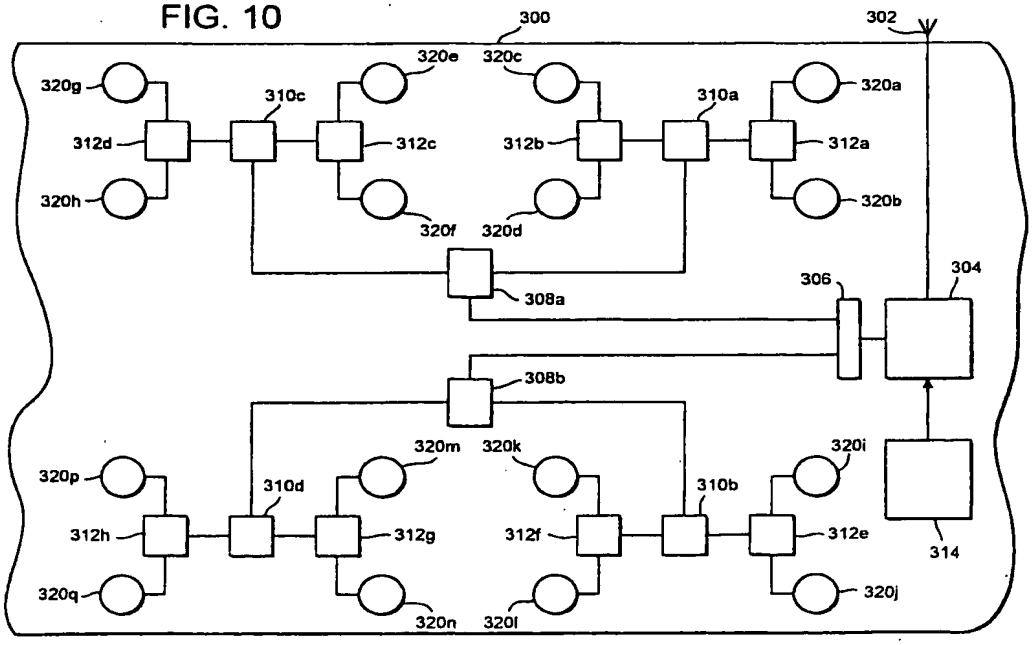
(54) Localisation registration method in mobile communication system

(57) A multi user communications terminal apparatus providing simultaneous access for a plurality of users to a communications network in which the geographical locations of each user are registered and periodically updated,

the terminal apparatus comprising a plurality of user terminals (320) each including electroacoustic transducers (34,36); and a common RF unit (304) comprising a shared RF amplifier (342) for coupling to a shared antenna system (302),

in which the terminal apparatus comprises means (348) for transmitting common location updating signals, and is arranged not to transmit separate location update signals for every one of said users.

FIG. 10



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